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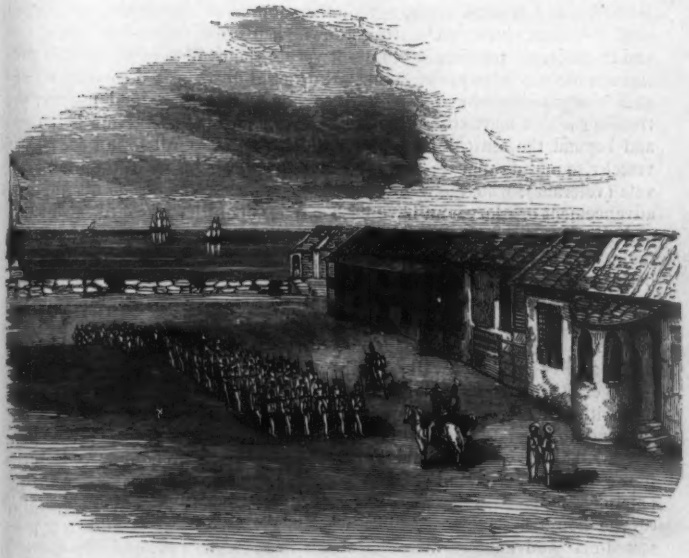
VIZAGAPATAM—NORTHERN PARTS.



FORT AND PARADE.

VIZAGAPATAM, or Vizay, as it is familiarly termed, is the next seaport town of importance at which we arrive, coasting northward, after leaving Massulipatam. Under the name of Vizagapatam is generally included the large civil and military station of "Wattair;" but, in point of fact, these two places are as distinctly apart as London is from Brighton—taking the average space of time occupied by special-train transit into consideration,

and remembering that only palanquins, slow coaches, and tattoas,* are at one's command in India. They differ in the nature of the country, the nature of the climate, the class of inhabitants, their vocations, occupations, and amusements; therefore, for the behoof of the uninitiated, I shall commence with Vizagapatam Proper, or that space included within the fortifications, and a mile round the fortified town. First and foremost, the good ship "Catherine" has come to an anchor within gunshot of the sea-battery of the fort; and after a little wrangling with the boatmen that have landed you, and haranguing the bearers destined to carry you in a rickety hack tonjou, you get in, are carefully shaken and taken, and in ten minutes deposited at the door of your future home, one of a long line of houses running parallel with the small but neatly-preserved parade-ground. Standing in the verandah to look about you, you embrace, almost in a single glance, the whole extent of what constitutes Vizagapatam Proper. On the opposite side of the parade-ground, just facing your door, are the barracks, the canteen, the reading and mess-rooms of the privates of that wing of the European invalid regiment which is permanently stationed in the fort. Behind this row of buildings you can see the thatched tops of the houses of such of the soldiers as have wives and families; and beyond these, again, the suburbs of the town, gardens and garden-houses, huts and broken-down hackeries, cocoa-nut trees, and paddy-fields, all terminating in a not very distant range of hills. To your right is the sea-battery, displaying six or eight goodly-sized cannon, a flagstaff, a signal-house, and a solitary soldier, old in years and misery, yet treading with a martial step the ramparts to and fro; behind him is the sea, and beyond the sea the horizon, on which the white sails of an occasional vessel rise and disappear; to your left is the officers' mess of the invincible vets (veterans), who, though they have long since relinquished all hopes of advancement or glory, and have been broken upon the wheel of misfortune and disease, still affectionately cling to occasional reunions at the mess-table, as a last fond souvenir of what they had been used to in brighter and better days, when youth and the world was before them, and fate had not cut off the pathway to glory. Next to the mess-house is the adjutant's quarters, then the pay-office, the commissariat, in which is included the armoury and cannon foundry, &c.; and beyond these, again, is the lake—a dirty puddle of water—with a model ship-of-war, and a few hungry ducks cruising about. Besides all these, there are the houses in the same row with your own, terminating to the right with the ramparts and the sea, and to the left in a multitude of huts, hovels, magazines, storehouses, bazaars, bakers' shops, butcheries, the market, and a fountain. All these four sides and the suburbs put together constitute the town of Vizagapatam.

The house mine host occupied was in a very central position; it possessed many advantages over the others in the same row, and was allotted to the use of the Judges of Appeal and Circuit, three in number, whose head-quarters were at Massulipatam, and who by regular rotation visited Vizay and the Zillahs in the interior. The house was commodious and coolly situated, with a large backyard and extensive outhouses; besides which it had a terraced roof, on which, in the cool of the evening, we were wont to promenade. But its situation, on the other hand, exposed us to three downright nuisances: the first of which was the vicinity of the

* Native ponies.

huge gun, that was regularly fired morning and evening, and the loud roar of whose report, bursting, as it often did, unexpectedly on the ear, was enough to palsy one's nerves for life, besides the deafening effect it had upon the tympanum, and causing the house to be seized with a fit of ague.

The second nuisance was a sequent on the first—a natural result from a cause. The gun fired, either because it was early dawn, and therefore time for the soldiers to turn out to get mustered and paraded, or else because it was eight o'clock at night, and therefore time for these soldiers to turn in; consequently, scarcely had the last vibration of the cannon's report died away, before the odious music of drums and fifes, painfully close at hand, and distinct and clear at those quiet hours of the day, burst upon the ear, tattooing and screeching for a quarter of an hour without intermission. This was the second nuisance.

The third nuisance arose from a very different cause to either of the foregoing. Just behind our yard there was a day-school—an institution under the patronage of some charitable individuals, where little niggers, in "flannel veskets" (to quote old Weller), and moral pocket-handkerchiefs, learnt musical tasks, somewhat after the practical system so much patronized by the renowned preceptor of Dotheboys' Hall. Soon after sunrise these urchins used to commence work under the auspices of a bucket of cold water and some hard soap, the master and mistress setting the example, and the urchins, male and female, ranged in couples, and following leader. The first start was a grand march round the back courtyard of the schoolhouse, starting from the washing-tubs and troughs, and making the circuit till they came opposite to them again. This march was accompanied with much stamping of the feet and vocal demonstration of what they were about for the benefit of the neighbours in general, the words of the splendid anthem being—

"This is the way we go to school,
Go to school, go to school;
This is the way we go to school,
Every day in the morning."

Then the operation of washing and scrubbing and combing, &c., ensued, each successive branch of the toilet being accompanied by an appropriate verse—as, for instance, "This is the way we wash our face," &c. These ablutions being duly performed, the work of the day commenced in earnest, with a plentiful and wholesome breakfast—meals being the only thing the children were not required to sing about, as a crust of bread in the mouth was supposed to interfere with the voice.

During the day we were continually being favoured with solos, duets, and full choruses, none being particular as to who finished first or last. These were sung to airs once very popular. Many of those that made the greatest impression upon us at the time we still remember; and we remember them well, because we used deeply to deplore our ignorance of the key-bugle, or any other nice loud instrument which might have effectually drowned the eternal squealings of these untuned children of song.

"I love little pussy," was a regular accompaniment to 10 A.M., by the large clock; half-past ten was the forerunner of a glee, sung to the air of "Let the bumper toast go round," the words being so arranged as to instil into the juvenile and weak minds of the children the elements

of Euclid—an idea from which the professor at Addiscombe might take a hint; and we therefore contribute so much of the song as we can remember.

Children, with right hand resting on left shoulder, and left hand under right elbow.

"Here's an angle; here's another;
Here's an angle; here's another;
Rising, falling, slanting, rising,
All three parts one size comprising,
Here's a circle wheeling round."

As the latter line is sung, the position of the right arm is changed, and the hand describes circles in the air.

Thus, as we said before, we were subjected to three nuisances, the most torturing of which was certainly the charity-school. Had the unhappy little urchins been taught any useful art, by earnest application to which in future days they might earn a pittance, even though they were at it tooth-and-nail, or hammer-and-tongs, learning to be carpenters, blacksmiths, tailors, cobblers, &c., many of the neighbours would have cheerfully overlooked the riot and noise, and still more cheerfully contributed to the support of such an establishment; but it was a nuisance and a folly to bring up poor destitute creatures, and accustom them to every comfort of home and good wholesome food till they became habituated to such easy living, and then turn them adrift on the world, too ill instructed to compete with native clerks; too nicely brought up to bend to manual labour. Their main accomplishments consisting in being able to read and write a little, and sing, *à l'Indien*, without ear or taste for music, a few Psalm tunes, and "Goosey, goosey, gander."

The officers and gentlemen residing within the fort were always on the best of terms. The distance between it and Wattair in a great measure excluded them from mingling in the gaieties of the latter place; and in addition to this, with only one or two exceptions, they were literally invalids—shattered remains of men who, had an Indian climate suited their constitutions, once promised to be ornaments to their profession, and were possessed of an equal chance with others of some day getting to the top of the tree. Ill health and disappointment had acted their part with regard to them on the stage of life. The hoary-headed lieutenants, who would now never aspire to higher grades in the service, were daily encountering majors, nay, even lieutenant-colonels junior to them in length of service. This embittering memento of the shadow of past hopes in a great measure induced them to seek for and prefer retirement; and the gaiety of the world was a bitter mockery to many who felt with acutest anguish, that either misfortune or the follies of youth had for ever excluded them from the hope of again setting their eyes on the loved and distant shores from which they were doomed to a perpetual exile. An occasional dinner at their mess, or at the house of the civilian residing in the fort, with a quiet game at whist in the evening, was the *acmé* of their pleasure; and they kept up a bowing acquaintance with the more *élite* residents at Wattair by paying a quarterly round of visits, which were always well received and returned by those to whom the Fates had been more propitious.

The arsenal was under the charge of a very efficient officer, who had by his own merits and bravery risen from the ranks to the grade of lieutenant, and who is now a captain on the invalid establishment. To pay his offic

a visit during the daytime was a source of great amusement to the lounger. The armoury shining like resplendent diamonds; the gunpowder manufactory, through which, however, we hurry for fear of an explosion; the cannon-foundry, and the endless quantity of diminutive models of gun-carriages, cannon, matchlocks, rifles, and pistols; the rockets, the port-fires, the pyramids of cannon-balls, and formidable-looking bomb-shells. At all and each of these the gallant old soldier stops, and, regarding them with enthusiastic delight, falls into a reverie that leads him to long-past scenes of bustle and bloodshed; and if you like to listen to such tales he will never tire in gratifying you, recounting both personal and read-of adventures, commencing with the battle of Sallamander (Salamanca), as he calls it, and finishing at the storming of Rajahchikerimikeripoor, or some such jaw-breaking name, where he was one of a forlorn hope, and where, as he tells you with ecstasy, he got his fin put out of joint—meaning thereby his left hand, which has been run through in two places by the enemy's "bagonets."

Vizagapatam is justly celebrated for the very fine workmanship displayed in the manufacture of its sandalwood and porcupines'-quill boxes and baskets. Not even the Chinese, adepts though they be, can surpass the natives of Vizagapatam for chaste, rich taste, and exquisite finish. Desks, ladies' workboxes and workbaskets, watchstands and paper-weights, are a few among the variety of articles daily exposed for sale by this ingenious and industrious people. The workshops present a scene of busy life and confusion, and the workmen are divided into different classes, or grades, according to their various skill and acquirements. The young men new to the trade are simply employed sawing and shaping the wood into different forms and sizes adapted for the skeletons or framework of the various articles manufactured; those a step more advanced collect and sort these pieces according to the instructions of an overseer; joiners then take them in hand and join them, putting in additional ribs where strength and durability are requisite; fine workmen are, meanwhile, occupied in forming in their lathes the costly and richly-scented sandalwood, which is used for lining the whole of the interior of the boxes, divisions, drawers and all; whilst others are shaping and carving the ebony and ivory, serving as tasteful borderings to the work; and after these in importance come the pickers, sorters, and polishers of the quills, on whose dexterity and precision as to size, colour, and strength, much of the beauty and excellence of the work depend. The skeletons, or framework, being put together, they are then separated into different partitions: desks being allotted to men peculiarly skilled and well practised in their formation; workboxes to another set, and so on throughout. Each framework is placed in a basket, together with the quills, sandalwood, and ebony or ivory bindings, all picked, worked, and polished for immediate use. The head workmen have nothing to do but put them together. The quills are first taken in hand, which, with the assistance of a large caldron of glue, always on the boil, and emitting an effluvia enough to knock a horse down, are speedily stuck into the numberless gimlet-holes, ready drilled for their reception; and so closely are they put together that on the nearest inspection you can with difficulty discover space sufficient for a hair to protrude between them. Thick coarse brown paper, ready cut in long, narrow slips, is then stuck with glue to the inside; and against this, in turn, is attached the sandalwood, which constitutes the lining. The ivory or ebony borders

are then, by the same process, fastened on; and the whole being bound together with thick layers of twine, the boxes and their covers (which are yet in want of hinges, partitions, locks, &c.) are laid aside on a shelf to dry till the next day. When perfectly dry, the twine is taken off, the partitions are let in, and the boxes are handed over to a silversmith, who completes the work by adding the necessary little silver hinges and small silver knobs to the covers of the different small departments of the box, and the indispensable silver lock and key. This done, the boxes undergo a thorough scrubbing and polishing, and are then sent to a magazine, or storehouse, where they are carefully kept, wrapped up in silver paper, till a favourable opportunity occurs for disposing of them at a premium.

The ladies' workboxes, in addition to all the foregoing processes, pass through the hands of a looking-glass manufacturer, who gives a finishing stroke to their elegance by the insertion of appropriately-sized glasses in the lids of the boxes, which are neatly framed in satinwood.

The town of Vizagapatam is not so healthy by any means as the neighbouring station of Wattair, owing to its low and confined position: it is, nevertheless, an elysium in comparison to Massulipatam; and the "doctor," as the sea-breeze is facetiously called in India, which is a very regular and welcome visitor, sets in, generally, about two hours after midday.

Tamul and Telagoo are the languages most in use, though Hindostanee will pass muster very well.

The gardens in the suburbs yield abundant supply of fine fruits and vegetables, and there are a few decently-stocked shops, amongst which Hoffman's claimed the precedence. This man had, amongst other articles of use and curiosity, a queer old German clock, which literally astonished the weak minds of the natives and half-castes and Portuguese in the neighbourhood. It consisted of a sea of glass in perpetual motion, so long as the clock was going; a ship at anchor; a battery, on which a solitary soldier marched to and fro; a high watch-tower, whose diminutive clock indicated the hour; and a little boat, with four men and an officer, whose perpetual occupation was to row to and fro between the ship and the battery—a distance which occupied them an hour either way. When the boat arrived at the battery the hour struck, the soldier presented arms, and a savage little band of music rushed out, blowing defiance at the ship and the boat to the tune of "Blow, warder, blow!" The moment the music finished, the musicians retreated precipitately backwards into the watch-tower, and the boat, which pulled in a circle, was returning by rather a circuitous route to the ship: the instant it got alongside the tower clock struck the hour, but no ruffians rushed out this time, it was the ship's turn to do something wonderful; up flew a red flag with Death's head and marrowbones to the gaff, and six little bullets as big as peas, supposed to be fired from the pirates' gun, were shot by some skilful mechanism against the battery, which they all hit at the same instant, and so disappeared beneath a yawning glassy wave, which on close observation we found to be the only one stationary on the whole sea.

It was certainly a very ingeniously-managed toy; and old H., who persuaded the people that he had made it himself, was regarded as a regular pishash * by all the native inhabitants of Vizagapatam.

* Devil.

ON GEMS AND PRECIOUS STONES.*

The display of gems in the Great Exhibition was one of unexampled magnificence. To give a mere catalogue of its riches would occupy more than the hour appropriated to this lecture. My object will therefore be, to describe separately a few of the principal specimens there exhibited, premising only such observations on their history and distinctive characters as may be easily followed by those who are not acquainted with the technicalities of the subject; and then, in a general view of the remaining gems, to intersperse some remarks on the physical characters of each, and to conclude with an account of the principal localities in Brazil where by far the larger proportion of the diamonds of commerce are found; an exemplification of the mode of valuing them, the means of distinguishing the artificial from the genuine, &c.

From the earliest ages of the world's history the mineral treasures of the earth appear to have been, to a certain extent, known to man. In the second chapter of Genesis we read of the land of Havilah, "where there is gold," and where also is "bdellium and the onyx stone" (Gen. ii. 12); and in the Book of Exodus is a particular description of the breastplate of Aaron, enriched with many precious stones. These are distinguished as sardius (or ruby), topaz, carbuncle, emerald, sapphire, diamond, ligure, agate, amethyst, beryl, onyx, and jasper (Exod. xxviii. 17-19); but probably these names are now differently applied. The way in which precious stones are referred to in the Holy Scriptures, as well as in other ancient records, proves that they were always highly esteemed, either for their scarcity or their beauty, and were reckoned among the most valuable productions of the earth. Succeeding ages have confirmed this estimate, so that one of the common marks of opulence and taste in all countries is the selection, preservation, and ornamental use of gems and precious stones.

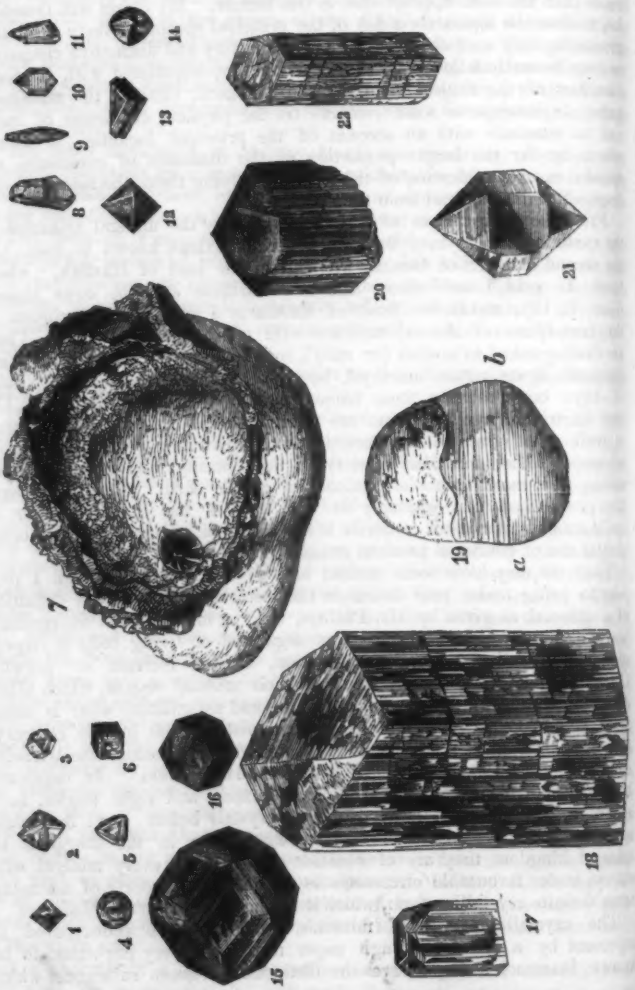
That we may have some precise idea of the substances which I propose to bring under your notice in this lecture, I will state the definition of a mineral as given by Mr. Phillips, viz., "a mineral is an unorganized body, and one which differs from an organized or living body in respect of structure, the manner of formation, and of increase or growth. Organized bodies increase by means of their internal organs, which allow of an internal circulation, approximating and assimilating what is beneficial, and rejecting what is useless; unorganized bodies, on the contrary, increase externally, and possess no internal organization, the particles composing them being attached by mere juxtaposition." In organized bodies, also, you rarely perceive plane surfaces and right angles, such as are presented by the large group of crystals before you: but while such forms in organic nature are extremely rare, in the inorganic or mineral kingdom they are of constant occurrence; every mineral substance, under favourable circumstances, having the property of assuming some definite crystalline form, which it retains as a distinctive character.

The crystalline form of minerals, which I have endeavoured to represent by a series of rough paper models, is very important to be known, inasmuch as it preserves the distinction between substances which

* Extracted, by permission, from a lecture by Prof. James Tennant, F.G.S., delivered at the Society of Arts, March 24, 1852.

PLATE I.—THE MOST COMMON CRYSTALLINE FORMS OF GEMS.

From Specimens exhibited by Mr. Tennant, in Class I., No. 14.



1 to 7, Diamonds; 8 to 11, Corundum; 12 to 14, Spinal-ruby; 15, 16, Garnet; 17, 18, Topaz; 19, Water-worn Pebble; 20, Tourmaline; 21 Quartz; 22, Beryl.

occasionally resemble each other in many respects. By attending to the forms of the crystals we are quite sure that we shall not find the emerald, sapphire, zircon, or topaz, in the form of a cube, octahedron, tetrahedron, or rhombic dodecahedron; nor the diamond, spinel, or garnet, in that of a six-sided prism, terminated at either end by a six-sided pyramid. For want of a knowledge of the crystalline form of the diamond, a gentleman in California offered 200*l.* for the small specimen of quartz which I have here. He knew nothing of the substance, except that it was a bright shining mineral, excessively hard, not to be scratched by the file, and which would scratch glass. Presuming that these qualities belonged only to the diamond, he conceived that he was offering a fair price for the gem; but the owner declined the offer. Had he known that the diamond was never found crystallised in this form, namely, that of a six-sided prism, terminated at each end by a six-sided pyramid (see fig. 21, Plate I., which is the exact size and shape of the stone), he would have been able to detect the fact, that what he was offered 200*l.* for was really not worth more than half-a-crown. Greater experience would have also taught him that diamonds, in their natural state, are devoid of that brilliancy which is given to them by artificial means. The finest crystals of quartz are more brilliant than those of the diamond. From the inferior lustre of the latter in their natural state it is extremely probable that numbers of diamonds are overlooked in the search for gold in Australia, California, and other gold-producing countries. Crystals of diamond are numerous; the three following forms are most common, the faces of which are often curved:—

a, the regular octahedron; *b*, the octahedron, having the edges replaced, forming the passage of that solid into the rhombic dodecahedron, fig. *c*.

In Plate I., figures 1 to 7, are also given figures of the exact size of the diamonds exhibited in my case. There is also before you a specimen (fig. 7) which was presented to your notice on a former occasion, about three years ago, when I read before your Society some notes on the probability of discovering diamonds in California. It is a mass consisting of water-worn pebbles of quartz, diamonds, and gold, cemented together by oxide of iron, from a river in the Brazils. The frequency of the occurrence of the several crystals of diamond may be inferred from an experiment made with an average parcel containing one thousand diamonds. There were one of the form fig. 6, ten of that of fig. 5, fifty similar to fig. 4, and the remainder resembled figs. 1, 2, 3, in about an equal proportion. With regard to the size and weight, five hundred out of the thousand were found smaller than fig. 1, which is the exact size of a diamond weighing half a carat; three hundred were of the sizes 3, 4, 5, 6; none exceeded a carat in weight. Eighty were of the size of fig. 2, each of which weighed a carat and a half. One only was as large as fig. 16: this weighed 24 carats. The remainder varied from 2 to 20 carats, a carat being equal to three grains and one-sixth troy. In the mineralogical department of the British Museum, the case No. 4

affords the best opportunity of studying this gem in all its varieties. This department of our Museum has been greatly enhanced in value within the last two years by the addition of the very fine collection of crystallized diamonds formed by the late H. P. Hope, Esq., and described in Mr. Hertz's catalogue of that collection.*

The Great Exhibition afforded special opportunities for the study and comparison of precious stones. From the invaluable contributions of her most gracious Majesty the Queen and those of other sovereigns, down to the collections of the various jewellers of this and foreign countries, the display was such as can never be forgotten by persons of taste sufficient to appreciate its exquisite beauty. Conspicuous above all was the Koh-i-noor, which, owing to imperfect cutting and fractures produced by rough usage, disappointed many a high-raised expectation. Those who were fortunate enough to see it when the sun's rays fell upon it, from two to three o'clock, were gratified with its brilliancy; but at other parts of the day it was so devoid of lustre as to excite the suspicion in many minds that it was no diamond at all—in fact, nothing but a piece of glass. In this case, as in many others, it was necessary to know at what hour of the day the gems could be seen to the best advantage; for example, the diamonds in the Russian department were in their greatest brilliancy at twelve o'clock. The Koh-i-noor was worn by its former owner, Runjeet Sing, as an armlet, and was considered in itself an ornament of such extraordinary value as to allow the wearer to dispense with the decoration of many other jewels. The Hon. W. G. Osborne, describing a visit to the hall of audience of this potentate, says, "The whole space behind the throne was crowded with Runjeet's chiefs, mingled with natives from Candahar, Caubul, and Affghanistan, blazing with gold and jewels, and dressed and armed in every conceivable variety of colour and fashion. Cross-legged in a golden chair sat Runjeet Sing, dressed in simple white, wearing no ornaments but a single string of enormous pearls round the waist, and the celebrated Koh-i-noor, or Mountain of Light, on his arm."

This diamond, in common with many other jewels of great price, was occasionally used to adorn the favourite horses of the potentate. A jewelled bridle, saddle, and other accoutrements, were displayed by the East India Company; and we find from the account given by the Hon. Miss Eden,† that the decorations of such accoutrements were exceedingly valuable. Describing the favourite horses in the Maha Raja's stable, she says, "The jewelled trappings of the horses were of the most costly description, the jewels being chiefly emeralds of immense size and value, hanging round the neck, covering the forehead, and fastened on the front of the saddle. The jewels and ornaments were said to have been worth about 300,000*l*. The Maha Raja was passionately fond of horses, and he would make war on a province to procure the surrender of any that were reputed of peculiarly pure breed. He kept them, highly fed, in large numbers, and was in the almost daily habit of inspecting them; adorning them on occasions of particular display with the finest jewels of his treasury, including the celebrated large diamond called Koh-i-noor,

* In the museum at Cambridge is probably the second best collection in England. This collection of diamonds was formed by the late Sir Abraham Hume, Bart., and a catalogue with eighty figures, by M. le Comte de Bournon, was published in 1815.

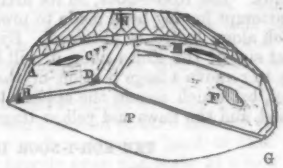
† 'Portraits of the Princes and People of India,' 1844.

or Mountain of Light." With great kindness he sent this diamond, with other precious stones, to the camp of the Governor-General, for the inspection of the ladies, and thus Miss Eden was enabled, from actual measurement, to make a drawing of the Koh-i-noor at a time when there was no reason to suppose it would ever make its appearance in this country. On the annexation of the Punjab, however, it was given up to the East India Company for the Queen of England, and was brought over to London in 1850. Its beauty was greatly marred by its irregularity of form. On closely examining it yesterday at Buckingham Palace, in company with my friend the Rev. W. Mitchell, I found that two of the larger faces were cleavage planes; one of them had not been polished, or it had been so slightly polished that the effect was not discoverable. By measuring the stone with this simple instrument, called a goniometer, and ascertaining the inclination of its larger faces, 109° 28′, I could tell which were the cleavage planes and which the cut planes of the diamond. Upon further examination I found two other cleavages, which, like the former, are parallel to the planes of an octahedron. The octahedron being the only crystalline form which represents all the cleavage plans, and parallel to the planes of this solid it is easily broken.

I will now refer to the flaws in the Koh-i-noor, which are shown on the following figure.

P, a large plane at the base of the diamond, which is a cleavage plane.

F, also a large cleavage plane, produced by a fracture—this had not been polished—and being inclined to the plane P at an angle of 109° 28′, affords a satisfactory means for determining the direction of the cleavage planes of the stone.



A, shows a flaw running parallel to the cleavage plane F: this constituted the principal danger to be apprehended in cutting the stone, and was most skilfully ground nearly out before any of the facets were cut. This flaw seemed to proceed from a fracture marked B.

C and E were little notches cut into the stone for the purpose of holding the diamond in its original setting.

N, a small flaw, which almost required a glass to see it, evidently parallel to the plane P.

D, a fracture from a blow or fall, showing at its base a cleavage plane.

There is every probability that the Koh-i-noor is only a portion of the original diamond of that name, as procured from the mines of Golconda. My own opinion is, that in its original form this diamond was a rhombic dodecahedron, and that in its present state it is about one-third of the original size. I am confirmed in this opinion by Tavernier, who states that it originally weighed 787½ carats; after having been broken or cut, it weighed 279-$\frac{9}{16}$; and if we make allowance for the difference between the French and English grains of that period, it would reduce it to 252 carats of the present time.* If we give Tavernier credit as to the original

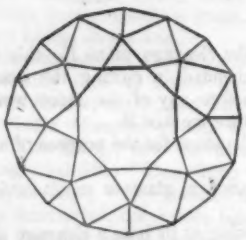
* 'Les Six Voyages, &c., Seconde Partie, Paris, 1676.' Tavernier, at page 249 of this volume, states the weight of the diamond to be 787½ carats; but at page 334 he calls it 793 carats.

weight of the stone, we may indulge in a very reasonable supposition that two other remarkable existing diamonds once formed part of it. Dr. Beke, in a paper read before the British Association at Ipswich, in 1851, says, "At the capture of Ceochan, there was found among the jewels of the harem of Reeza Kooli Khan, the chief of that place, a large diamond slab, supposed to have been cut [*broken?*] from one side of the Koh-i-noor, the great Indian diamond, now in the possession of her Majesty. It weighed about 130 carats, showed the marks of cutting on the flat and largest side, and appeared to correspond with the Koh-i-noor." Another diamond, which singularly corresponds with the Koh-i-noor, is the great Russian diamond; and it is not improbable that they all formed one crystal, and that, when united, they would, allowing for the detaching of several smaller pieces in the process of cleaving, make up the weight described by Tavernier.*

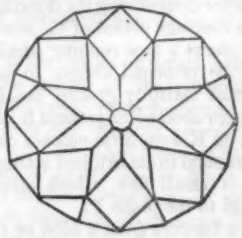
* Since the date of my lecture the recutting of the Koh-i-noor has been successfully accomplished by the Messrs. Garrard. The brilliancy and general appearance of the diamond have been much improved, but the weight has been reduced more than a third. As exhibited in the Crystal Palace, the Koh-i-noor weighed 186$\frac{1}{16}$ carats, and now weighs 102$\frac{3}{16}\frac{1}{16}$. I am indebted to Messrs. Garrard for the following account:—

"In cutting diamonds from the rough, the process is so uncertain that the cutters think themselves fortunate in retaining one-half the original weight. The Koh-i-noor, on its arrival in England, was merely surface cut, no attempt having been made to produce the regular form of a brilliant, by which alone lustre is obtained. By reference to the figures, which are the exact size of the Koh-i-noor, it will be clearly understood that it was necessary to remove a large portion of the stone in order to obtain the desired effect, by which means the apparent surface was increased rather than diminished, and the flaws and yellow tinge were removed.

THE KOH-I-NOOR IN ITS PRESENT STATE.



UPPER SURFACE.



UNDER SURFACE.

"The process of diamond-cutting is effected by a horizontal iron plate of about 10 inches diameter, called a *Schyf*, or *mill*, which revolves from two thousand to three thousand times per minute. The diamond is fixed in a ball of pewter at the end of an arm, resting upon the table in which the plate revolves; the other end, at which the ball containing the diamond is fixed, is pressed upon the wheel by moveable weights at the discretion of the workman. The weights applied vary from 2 to 30 lbs., according to the size of the facets intended to be cut. The recutting of the Koh-i-noor was commenced on July 16th, 1852, his Grace the late Duke of Wellington being the first person to place it on the mill; the portion first worked upon was that at which the planes P and F meet, as it was necessary to reduce the stone at that part, and so to level the set of the stone before the table could be formed; the intention being to turn the stone rather on one side, and take

Mr. H. T. Hope's blue diamond, weighing 177 grains, was an object of high interest. It combines the beautiful colour of the sapphire with the prismatic fire and brilliancy of the diamond. It is tastefully mounted as a medallion, with a border *en arabesque* of small rose diamonds, surrounded by twenty brilliants of equal size and shape, and of the finest water, averaging four grains each.

The remaining specimens were remarkable for their beautiful arrangement rather than for extraordinary size. You all remember a magnificent diamond bouquet, and other ornaments, exhibited by Messrs. Hunt and Roskell, the former of dazzling brilliancy, and capable of being taken to pieces even to the petals of the flowers, and converted into seven brooches. Also the bouquet of rubies and diamonds exhibited by Messrs. Morel and Co., which was extremely beautiful, and capable of division

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the incision or flaw at E, and a fracture on the other side of the stone, not shown in the engraving, as the boundaries or sides of the girdle. The next important step was the attempt to remove an incision or flaw at C, described by Professor Tennant and the Rev. W. Mitchell as having been made for the purpose of holding the stone more firmly in its setting, but pronounced by the cutters (after having cut into and examined it) to be a natural flaw of a yellow tinge, a defect often met with in small stones. The next step was cutting a facet on the top of the stone immediately above the last-mentioned flaw; here the difference in the hardness of the stone first manifested itself, for while cutting this facet, the lapidary, noticing that the work did not proceed so fast as hitherto, allowed the diamond to remain on the mill rather longer than usual, without taking it off to cool: the consequence was, that the diamond became so hot from the continual friction and greater weight applied, that it melted the pewter in which it was imbedded. Again, while cutting the same facet, the mill became so hot from the extreme hardness of the stone, that particles of iron mixed with diamond powder and oil became ignited. The probable cause of the diamond proving so hard at this part is, that the lapidary was obliged to cut directly upon the angle at which two cleavage planes meet, cutting across the grain of the stone. Another step that was thus considered to be important by the cutters was removing a flaw at G. This flaw was not thought by Professor Tennant and Mr. Mitchell to be dangerous, because, if it were allowed to run according to the cleavage, it would only take off a small piece, which it was necessary to remove in order to acquire the present shape. The cutters, however, had an idea that it might not take the desired direction, and, therefore, began to cut into it from both sides, and afterwards directly upon it, and thus they succeeded in getting rid of it. While cutting, the stone appeared to become harder and harder the farther it was cut into, especially just above the flaw at A, which part became so hard, that, after working the mill at the medium rate of 2,400 times per minute, for six hours, little impression had been made; the speed was, therefore, increased to more than 3,000, at which rate the work gradually proceeded. When the back (or former top) of the stone was cut, it proved to be much softer, so that a facet was made in three hours, which would have occupied more than a day, if the hardness had been equal to that on the other side; nevertheless, the stone afterwards became gradually harder, especially underneath the flaw at A, which part was nearly as hard as that directly above it. The flaw at N did not interfere at all with the cutting. An attempt was made to cut out the flaw at A; but it was found not desirable, on account of its length. The diamond was finished on September 7th, having taken thirty-eight days to cut, working twelve hours per day without cessation."

By permission of her Majesty, models of the Koh-i-noor, as it arrived in this country and in its present state, have been placed with the diamonds in the mineralogical department of the British Museum, Case No. 4.

into stomacher, head-dress, brooches, and bracelets. The articles exhibited by the Messrs. Garrard showed a high degree of skill and good taste. Among them were several splendid opals and brilliants, arranged as necklace, stomacher, earrings, and bracelets; also some large and very pure brilliants, arranged, with fine Oriental pearls, as a tiara. It is impossible to particularise further; but the merits of our English jewellers (the above-named with many others) were fully appreciated by the Jury, and will always be remembered by the numerous visitors who, to their own personal inconvenience, thronged around the attractive objects displayed.

While giving all due praise and honour to our own jewellers, we must, however, confess ourselves equalled, if not surpassed, by those of France and Russia. The exquisite taste of many of their productions, together with the beauty of the jewels themselves, drew forth exclamations of delight from the mineralogist as well as from the general spectator. The diamond wreath in the Russian department, in imitation of the leaves and fruits of the bryony, was exceedingly beautiful. The fruit was formed of long pear-shaped emeralds. Another beautiful wreath represented currant branches in diamonds, with polished uncut rubies suspended as the fruit. This, with a bouquet of diamonds of singular beauty, representing eglantine and lily of the valley, brought great fame to Messrs. Kämmerer and Zeftigen, jewellers to the Imperial Court of Russia. A magnificent diadem, in the same department, exhibited by Messrs. Jahn and Bolin, contained a dazzling display of 1814 brilliants and 1712 rose diamonds, with 11 very beautiful opals and 67 rubies.

Among the jewels in the French department the most remarkable were those exhibited by M. Lemonnier of Paris, executed for the Queen of Spain. A profusion of precious stones were arranged as flowers, foliage, and ribbons, with great simplicity and harmony of effect. A large proportion of these were diamonds, but by their clever arrangement there was no appearance of crowding or over-elaborate display.

NO LIE THRIVES.—No. XVI.

Willis's heart beat as he approached the station at Seaforth. He had crossed the platform, and was hurrying through a gate which led to the road, when his arm was arrested, and, turning sharply round, he beheld Mr. Sharman. The truth at once flashed upon him, he turned deadly pale and sank on a bench near him. Mr. Sharman seated himself by his side.

"It is even so, my dear Willis," said he, in a tone of the deepest sympathy. "Your gentle sister is gone, where I hope in due time you and yours, and I and mine shall follow. Her death, like her life, was peace, and no suffering attended it." His voice shook, and the tears started into his eyes. "Your poor mother," he was unable to proceed and covered his face with his handkerchief. But the sight of his emotion acted beneficially upon Willis, and he found relief in those kindly drops which man, the heir of woe, is entitled to shed for his misery.

In a few moments, however, he was sufficiently recovered to walk to his home with Mr. Sharman, who left him as soon as the door was opened. In another instant he was clasped in the arms of his mother. But sorrow like theirs must be sacred. It is not the harrowing picture of human anguish that amends the heart, but the lesson learnt from the meek

submission of the Christian. Mother and son were a support to each other, for the trust and confidence of both were in the God and Saviour whom they alike adored. Willis stayed to pay the last sad rites to his beloved sister, and then prepared to depart. He first, however, proposed that his mother should accompany him and take lodgings near him; but the idea was painful to her, and it was finally agreed that Emma Sharman should take up her abode with her for a month, at the end of which Mrs. Richmond promised that she would either visit London, or take a little journey to see some friends who had long solicited her company.

Before Willis left Seaforth, Mr. Sharman, with all the confidence of a parent, had spoken very freely to him respecting several circumstances that concurred to annoy him. The parting with Willis had been a very serious loss to him, and many vexations had sprung up in the shop which he could neither have foreseen or guarded against. The death, too, of Mrs. Sharman, which had occurred some months only before Willis left Seaforth, had made not only a great inroad in his happiness, but was attended with disadvantageous results to him in all other respects. It was very evident that nothing could have rejoiced him more than again to have had Willis under his roof; but it was equally clear that he scrupulously avoided giving even a hint of such a desire. The young man, however, at once put the question.

"Shall I return to you, sir?" said he, "I will do it with pleasure; my mother, too, will benefit by such an arrangement."

"No, Willis," replied he, "it is better for your future prospects that you should go back to London. It has been a relief to me to talk freely to you, but I should be ashamed to profit by the affectionate concern I have aroused in your mind. We know little what part Providence designs us to play in life's great drama: but of this we may be sure, it is never true wisdom to force ourselves upon the stage, and prematurely hasten the plot. Let us wait: the good and wise hand that directs all will guide succeeding events for the best as it has done through the past. In the mean time I will keep nothing from you. Young as you are, you have given me such proofs of discretion, fidelity, and personal attachment, that I feel justified in speaking to you with the freedom more suitable to your superior in years, and with my own equals in other respects."

Mr. Sharman then proceeded to remind him that he and his brother George, who was a tradesman in the county town in a much larger business than himself, had been in the habit of occasionally accepting bills for each other.

"A more honourable and punctual man of business cannot exist than my brother George," said he; "I could trust him to any amount, and in fact he had made a considerable sum of money. He had talked of giving up business altogether, and I believed that such would have been the case, when a short time ago I had a visit from him. His two sons, it seems, have lately been putting their father to a very great expense; the mania for speculation has seized them, and to save them from disgrace, their father has settled several accounts for them to his own inconvenience, I know. Reports have reached me of an unsatisfactory nature, as to the solvency of a firm with which he has had large dealings."

"And I fear you have accepted some bill, that gives you uneasiness?" said Willis, perceiving that Mr. Sharman made a pause.

"More than one," replied he; "and I own I am very uncomfortable. George would never let me be the loser of a shilling if he could avoid it;

but men in business, above all others, have little command over events and circumstances."

"But they are not short bills, I hope?" said Willis, anxiously; "and that both you and your brother will have time to turn yourselves."

"I hope so, too," replied Mr. Sharman; "but my dear Willis, rely upon it there is no time so quick in arriving as that which brings the day of appointed payment. For some weeks to come I have nothing very much to fear, though it is impossible to divest myself of anxiety. George's accounts are not like mine, but complicated, and his business lies wide."

It was in the power of Willis to listen only respectfully to what was confided to him, and to feel honoured by the compliment. He said but little, though still that little was to the purpose.

"I am almost ashamed," said Mr. Sharman, "to relate to you another annoyance to which I am subjected, because the meanness of the man should shield me from feeling his conduct; but in truth Cartwright makes such a point of insulting me, and, as far as he is able, of injuring me, that my patience is sometimes tested almost beyond endurance by his behaviour."

"And have you not spoken to him in such terms as he deserves?" said Willis quickly, and with something of his former flashing eye.

"No, never," replied he; "there is no mistaking his aim, then why should I reveal his success by my words, which he cannot perceive by my manner? Besides, Willis, it is a good saying, 'When you can't remedy an evil, take care that you do nothing to increase it,' which I look upon would be the certain effect of any intemperate speech or action on my part." He paused, and then with a sigh added,—"Besides this, I have none near me who is what you were to me for a considerable time past."

"Whatever I may be," cried Willis, warmly, "you made me. He who is served faithfully by those under him, has, I have already had sufficient experience to prove, himself to thank; the employed is generally pretty much what his employer has moulded him into."

"Poor Frank!" said Mr. Sharman, "who is to blame for his misconduct? I made no difference in my behaviour between you."

"*My* mother," replied he, "strengthened your influence, *his* mother I fear counteracted it, at least if I may rely upon what he told me respecting the deceit that was practised in his home upon his father, and in turns upon every member of the family. I would not make one of Frank's sisters my wife, for all that."

"Not Harriet?" said Mr. Sharman, fixing his eyes on him.

"No, not Harriet," replied he; "good-humoured and pretty as she is, and endowed, too, as she is with many amiable qualities."

"And why not?" asked the other.

"Because I cannot help feeling that she and her sisters," replied Willis, "must have been so accustomed to deceit from their earliest days, that the moral sense alone of the rectitude of truth must be greatly injured, if not entirely destroyed in their bosoms. The girl I should choose must be one who resembles my dear mother, and," he added, in a low voice, "my dear sister."

"Harriet was a good deal with them both," observed Mr. Sharman.

"She was," replied he; "and so was—" he stopped short, coloured, and then, evidently to turn the conversation, inquired after Mr. Davis.

"This sad affair," said Mr. Sharman, "has added years to him; for

one so tall—he was very upright you know—he now stoops: but I scarcely ever see him, for he avoids me if he can when we meet anywhere but at the Bank. As for Mrs. Davis, I never in my life saw a woman so altered in appearance in so short a time. They have heard nothing of Frank, but conclude that he is gone to Australia. Ned, we know, sailed for Melbourne a few days after he left this place."

The parting between Willis and his mother was very sad; but there was comfort in their grief: they felt that though a blessing had been taken away from them, each had a blessing left in the other, and both owned deep cause for gratitude to God for such mercy.

When Willis reached the terminus in London, he suddenly encountered Mr. Davis, and respectfully touched his hat to him. Mr. Sharman had told him no more than the truth—he was indeed very much changed in appearance. To his surprise Mr. Davis accosted him, for on other occasions he had only returned his bow if they chanced to meet.

"If I had known," said he, "that you were returning by the same train, we might as well have travelled together."

This arrangement would not have suited Willis, for he was a second-class passenger, and Mr. Davis a first-class passenger, but he was gratified at the manner in which the latter had spoken to him. He immediately offered to look after his luggage, but was answered that he had only the carpet-bag which he held in his hand.

"To what part of town are you going?" said Willis. Mr. Davis told him. "Then let me see for an omnibus. Look, it is pouring with rain, in another minute there will be scarcely a conveyance to be met with."

Willis immediately disappeared, and almost as quickly returned. Mr. Davis hastened towards him; when the former hurrying him forward, seized the carpet-bag, and they reached the omnibus just in time to obtain two places. Willis drew aside to let Mr. Davis get in, and then springing after him took his place beside the door. They had not gone far before a passenger desired to be set down. Willis with his umbrella struck the arm of the conductor, and gave him the required message; soon after he again touched him and said, "You pass the ——— Hotel, do you not? This gentleman," looking at Mr. Davis, "wishes to be set down there."

In another minute or two the omnibus stopped. "Now, sir," said Willis, giving his hand to Mr. Davis. They stood by the step; Mr. Davis drew forth a shilling which he gave to the conductor. The man's hand was wet and cold, and as Mr. Davis received the sixpence from him, a sort of feeling of disgust passed over his countenance; he wiped the coin with his glove, which he had taken off to draw out his purse, and was stepping on the pavement, when his foot slipped, and he would probably have fallen had not the conductor caught hold of him.

"Thank you, young man," said he, and the omnibus drove on. Turning to Willis as they stood at the entrance of the hotel, Mr. Davis took a friendly leave of him, promising at the same time to inform his mother that he had arrived in safety. Willis thanked him, and pursued his own way to Regent Street.

The appearance of Sally Groves on the evening formerly mentioned had powerfully affected Frank. He did not fail to look for her at the place she had named, but some weeks elapsed before he again caught sight of her: he had no sort of regard for the unhappy girl—their acquaintance had begun in folly, and had ended in disgrace; but she was the only

being whom he knew, or who he believed really cared for him in that city of worlds, in which he found himself alone; and when he fancied that she too had left him to his fate, a pang, though a selfish one, was awakened in his heart by the thought. One evening, however, she was suddenly at his side.

"Oh, Frank!" cried she, "I have watched for you most evenings, and yet missed seeing you; I don't ask where you lodge, you have nothing to fear from my visits. But you are in distress, and that's enough for me. I know more about Ned and the cause of your leaving home than you suppose. He is a villain every way, and has made both you and me tools for his own base purposes. Here! take this, and if ever you think again of Sally Groves pity her."

She was out of sight in an instant; the little soiled packet she had thrust into his hand remained as she had deposited it there; still he continued to gaze after her. Several speaking to him at once, and angrily complaining of his inattention, he hastily put the packet into his pocket, making no reply to the reprimand he had received. It was late, and he was very weary when he went to rest. He thought no more of Sally and the packet, till, on dressing himself the next morning, he accidentally put his hand into his pocket; he drew it forth and opened it—it contained three shillings.

He stood gazing at the money, and a feeling ran through his frame, which he had never before experienced; a hue of the deepest crimson overspread his face; shame, sorrow, admiration, claimed each a share in the sensations which filled his bosom. For a moment he felt truly humbled, and could he have recalled the past, as concerned Sally especially, he would have been most thankful.

"Poor girl!" sighed he, again folding the silver in the dirty piece of paper she had given him, "does she think I could make use of these? No, let me starve first!" and so saying he put the packet into his waistcoat pocket, intending to return it to her when he should next see her, which he made no doubt would be very soon. In this, however, he was much mistaken; months passed and he saw no more of Sally. Tired and disgusted with his occupation, he resigned it, and sought other employment; but after many humiliating changes, and having endured great distress, he once more applied to William, the waiter at the inn in ——— Street, and after some delay succeeded in obtaining his former situation.

It was not till he had been really compelled by necessity that he had appropriated any part of the little sum Sally had given him to his own use. One shilling yet remained when he obtained employment, and this, still enclosed in the piece of paper in which it had been at first wrapped, and made yet more secure by a second covering, he continued to wear in his pocket, firmly resolving to return the other two shillings as soon as he was able. He was now every way wretched. The society with which he was compelled to mix was hateful to him, while the thought of Seaforth and of all he had sacrificed by his conduct, stung him nearly to madness. Sometimes he had recourse to drink to drive away the harassing reflections that tormented him, and if a bright colour now glowed on his cheek, it was no longer that of health and ripening manhood.

[*To be continued.*]

THE HEPATICÆ, OR LIVERWORTS.—No. I.

THERE is a small tribe of plants, consisting of only six genera, but of a large number of species, some of which are so minute as almost to have escaped the notice of any except the most advanced botanists, yet so exquisitely delicate and beautiful in their appearance when closely examined, so peculiar in their structure, and many of them emitting, when trodden on, so remarkable a fragrance, as well to deserve an attentive study.

The organization of these tiny plants is of a very simple character, but its perfection is such as to challenge praise and adoration for their Maker; and did earth exhibit no other proof of the existence of a God than a careful microscopic examination of these diminutive specimens of vegetation would afford, there would, or ought to be, sufficient in them alone to refute the cavils of the most learned sceptic, and to prove beyond dispute that the hand of a Divine and Almighty Creator originated them.

The order of which I speak is that of the Hepaticæ—a tribe which forms a sort of link between mosses and lichens, its genera descending in a beautiful and obvious gradation from the one of those families to the other.

The Hepaticæ are small, cellular plants; their leaves, where developed, are often lobed, or divided, almost always without the least trace of midrib or vein, often forming one substance with the stem, and the whole plant differing from mosses by being much more loosely cellular in their structure than plants of that tribe.

The different genera which compose this order vary very materially in their fructification, some bearing capsules more or less resembling those of different descriptions of mosses, others having their fruit imbedded in the substance of the frond, like some kinds of lichens.

The fruit is a theca, destitute of a lid, or operculum, such as we have described as forming part of the capsule of mosses, but furnished with a calyptra, or veil. This theca opens by two or four valves, which rupture at the apex; and the calyptra, instead of being carried up on the summit of the capsule, as in mosses, divides at the point, and allows the theca to rise above it. This theca is either sessile, or mounted on a seta, or on a common receptacle. The sporules are sometimes free, and sometimes collected round a columella, or central spike, but more often they are accompanied by elastic spiral filaments, called elaters, of highly curious and singular formation, by means of which the sporules are dispersed on the opening of the theca.

The habitats selected by the Hepaticæ are various. In boggy places, in the rocky beds of torrents and watercourses, in mountain rills, and on moist rocks, plants of this tribe delight to dwell. Sowerby says, "Some cover with a rich lucid-green coating the otherwise bare surface of the ground; some grow among mosses in swamps, clothe the decaying trunks or roots of trees, under the shelter of damp woods and plantations, or fill up the interstices of the grass in similar places." They are also to be seen lining the insides of caverns, and coating with a living green the stonework which surrounds wells and fountains, that without this vegetable clothing would be wholly bare and uninteresting. "When wet," says Sir J. A. Smith, "many of this tribe diffuse a powerful

aromatic odour, familiar to most people in a grove or shady grass-plat after rain, or whilst the morning dew is on the ground; yet few are, perhaps, aware of the minute vegetables to which this fragrance is almost entirely owing."

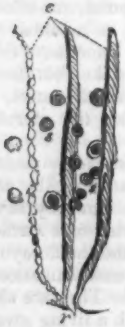
We have said that there are six genera of British Hepaticæ: these are—1st, Jungermannia; 2nd, Marchantia; 3rd, Targionia; 4th, Anthocerus; 5th, Sphærocarpus; 6th, Riccia. On each of these we must say a few words, accompanying our remarks with some drawings of one or two of each genus.

The Jungermannia is by far the largest of the genera, numbering about one hundred British species, most of which have very much the habit of mosses, the chief difference being in the absence of the operculum, or lid, and the columella, in the permanent attachment of the calyptra, and in one or two other points, but chiefly in the presence of some curious spiral filaments, with which the sporules are connected. Some of the species have distinct leaves, whilst in others the leaves form one substance with the stems, from which they are not distinguishable. The leaves are often accompanied by stipules.

The species of Jungermannia differ very much from each other both in size and colouring, some being so minute as to be scarcely perceptible to the naked eye, whilst others extend to the length of several inches. Their hue is often of a most brilliant green; sometimes, we find them of a deep purple tint. One species varies from a silvery hue to a pale yellowish-brown, or nearly black; and yellowish-green, purplish-brown, tawny, and many other colours are found among them.

Man has so often pronounced things to be "of no use" which after-times and more experience have shown to be articles of high importance in the economy of nature, that even those who are sceptical, or forgetful of the truth that God has created nothing in vain, have now become afraid of committing themselves by saying that the plants which form the different families of this minute genus are useless. They, therefore, more wisely, because more humbly, say of the Jungermannia, "uses unknown." Certainly no quality, or other characteristic that might make them serviceable to man has as yet been discovered; but no doubt they have an office assigned them in affording food, shelter, or some other benefit to some or other of God's works, either in the animal or vegetable kingdom.

Fig. 1.



We have alluded to the elaters, or spiral threads, which are found in most of the Hepaticæ. Before we proceed to the delineation of different individuals, we must give a rather more detailed account of the formation and functions of these singular organs. The spores, or parts answerable to the seed, are formed, as in mosses, in parent cells, the rupture of which leaves them free in the hollow of the capsule; but in the Hepaticæ there are other cells formed amongst them which do not produce spores, but compose spiral threads, much like the spiral air-vessels in other plants, but free and more elastic (fig. 1).

When the cells have attained their full maturity, the membrane which divides them gives way, and the spiral threads have then a tendency

to spring up, but are prevented from doing so by the pressure of the spores which surround them on all sides, and are now mixed up with them. When, however, the spore-case opens at the top, this difficulty is removed, and the elaters suddenly lengthen and jerk out the spores which may be adhering to their coils, thus assisting in dispersing them (fig. 2). These spores are possessed of a strong hygrometrical power, and expand or contract in a beautiful manner under the influence of moisture, or its reverse; so much so, that even breathing on them will alter their position.

Fig. 2.

Besides the usual mode of fructification by spores, some species of Hepaticæ occasionally produce organs of a very different character, called gemmæ; these—which consist of little granules, forming small balls either at the point or in the axils of the leaves (fig. 3)—are prolific, and from them the plant is in some instances propagated.

Fig. 3.

Let us now notice a few of the most interesting and remarkable species which are ranked under the genus Jungermannia. One very minute species (Jungermannia Sphagni, or Bog-moss Jungermannia), which is not unfrequent on spongy heaths, is peculiar in its growth. It overruns the sphagna and other aquatic mosses, to which it attaches itself by means of numerous radicles, thrown out from the under side of the slender, unbranched stem, which bears only short, lateral shoots, from which the fruit proceeds. The leaves are nearly globular, pale green, with a pink tinge, chiefly on the under side. Another species (J. crenulata) forms spreading tufts on bogs and moist heaths. This also produces nearly globular leaves, but it is tinged with purple, the thick, crenulated appearance of the margins (whence its specific name) arising from the outer series of its cells being larger than the rest. The theca when ripe is black.

The compressed, upright Jungermannia (J. compressa) is a native of mountain rills and rivulets; its compact structure and the mossy substance of its leaves well suiting it for meeting the swift, strong currents which it has to encounter in such situations (fig. 4). It grows, when not disturbed by the force of the stream, to a height of from two to six inches, forming broad tufts. The leaves form two erect rows, very closely pressed to the stem, of a purplish-green colour, the young shoots exhibiting stipules, but small and distant. Our figure shows the singular, flower-like appearance of the fruit when the spore-case has opened.

Fig. 4.

J. turbinata is frequent in limestone and marly districts, growing in moist, shady spots on banks. Its hue is pallid, but the large and conspicuous reticulation of the foliage renders it remarkable.

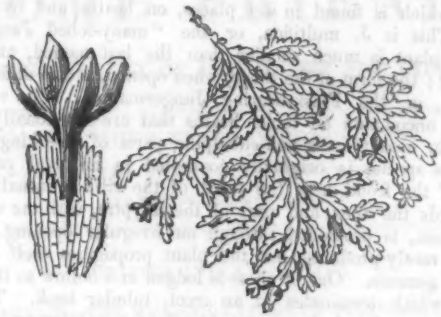
There is one of our species which is to be met with chiefly on moist rocks in the Alpine districts of Ireland, Scotland, and North Wales, which is very remarkable in its appearance. The stems, which are loosely tufted, and grow interspersed with mosses, extend four or five inches in length; the leaves are closely set, and their lobes so deeply divided as that they might be taken for separate leaves. The longer lobes, which imbricate the sides of the stem, are ovate, and spread horizontally; all are of a deep purplish, or yellowish-brown colour, marked with close reticulations, and beautifully fringed at the margin with tooth-like ciliæ. It emits a fetid odour when drying. This species is the Flat-leaved Jungermannia (J. planifolia).

Another species (J. pusilla, or the Dwarf Jungermannia) grows on moist, shady banks in a clayey soil. Its stems are short and creeping, throwing out numbers of long purple radicles from the under side. The leaves, which are comparatively large, are closely set in two spreading rows, and very irregular and angular in their outline. The theca is globose, separating into four thin, irregular, jagged valves, and one peculiarity of the species is, that sometimes two or three thecæ arise from the same perichætium, which in this kind is large, bell-shaped, and plaited. The perichætium is the sort of involucre from which the theca springs. The fruit of J. pusilla appears in the autumn and spring.

J. platyphylla selects quite a different position from those which we have before cited. It is frequent on trunks of trees and old walls; its growth, too, is peculiar, inasmuch as its fruit is borne laterally, and starts from the sides, or points of the convex leaves (fig. 5), which are disposed in a pinnate form on the stems. Its hue is usually of a bright green, but varies in different habitats.

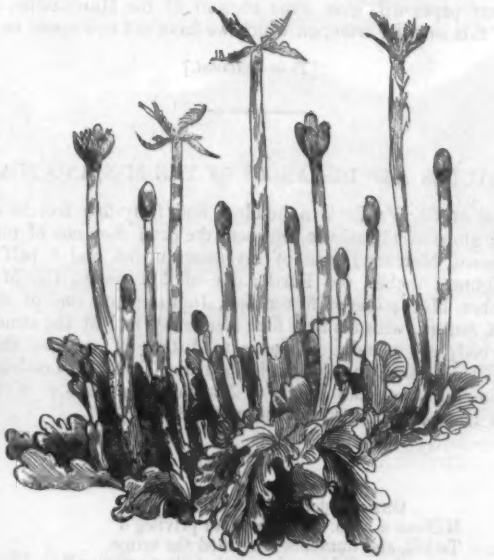
We must pass over many interesting species without notice, and hasten on to a division of the tribe so different in appearance and in some

Fig. 5.



points in structure as almost to lead us to expect that they would be classed under some other head than that of the Jungermanniæ. These are called Frondose, or Leafy Jungermanniæ. J. pinguis, or the Fat

Fig. 6.



Jungermannia, of which we give a figure (fig. 6), has a tumid, oblong frond, very fleshy and slippery, and the whole plant is described by Sowerby as "of a wet, slippery substance, tender, like boiled vegetables."

The seta, which springs from the lower part of the frond near the margin, is thick and pellucid, the theca oval and black. It is pale green, and grows in loose patches in moist places during the summer.

There is another species, somewhat similar in its slimy and damp character, which is found in wet places, on heaths, and by the sides of ditches. This is J. multifida, or the "many-lobed Jungermannia." The whole plant is much smaller than the last named, and the setæ more slender; the form of the theca, when opened, is also different.

J. Blasia, or the Flask-bearing Jungermannia, is a very curious species, not uncommon on moist heaths that are occasionally overflowed with water in mountainous and subalpine parts of the kingdom. The fruit in this species is originally concealed in an oval cavity in the substance of the frond, near the point of the rib: eventually the frond bursts towards the apex, and part of the calyptra, with the whole of the seta and theca, is protruded through an irregular opening. The true fruit is very rarely produced, but the plant propagates itself by means of two sorts of gemmæ. One of these is lodged in a hollow at the extremity of the rib, which terminates in an erect, tubular beak. The gemmæ of this kind are globular, reticulated, and of a pale green, and flow in considerable numbers through the mouth of this beak. The other kind consists of small, black, spherical masses of a granular or pulpy substance, which appear within the epidermis, or skin, on the under side of the frond.

This genus takes its name from Louis Jungermann, a German botanist.

Our next paper will give some account of the Marchantiæ, and other genera of this singular tribe, on which we have not now space to enter.

[*To be continued.*]

MAGNITUDES AND DISTANCES OF THE SUN AND PLANETS.

The dome of St. Paul's is a hundred and forty-five feet in diameter. Suppose a globe of this size to represent the sun; then one of nine inches will represent Mercury; one of seventeen inches and a half, Venus; one of eighteen inches, the Earth; one of five inches, the Moon; one of ten inches, Mars; one of fifteen feet, Jupiter; and one of eleven feet and a half, Saturn, with his ring four feet broad, and at the same distance from his body all round. Then as to distances: suppose the Sun to be at St. Paul's, then Mercury might be at the Tower of London; Venus at St. James's Palace; the Earth at Marylebone; Mars at Kensington; Jupiter at Hampton Court; and Saturn at Guildford.

One murder made a villain;
Millions a hero. Princes were privileg'd
To kill, and numbers sanctified the crime.
Ah! why will kings forget that they are men?
And men that they are brethren? PORTEUS.